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Remarks

The above amendments and these remarks are responsive to the Office Action mailed December 13, 2006. With entry of this amendment, claims 1-20 are pending. Applicants thank the Examiner for carefully considering the subject application.

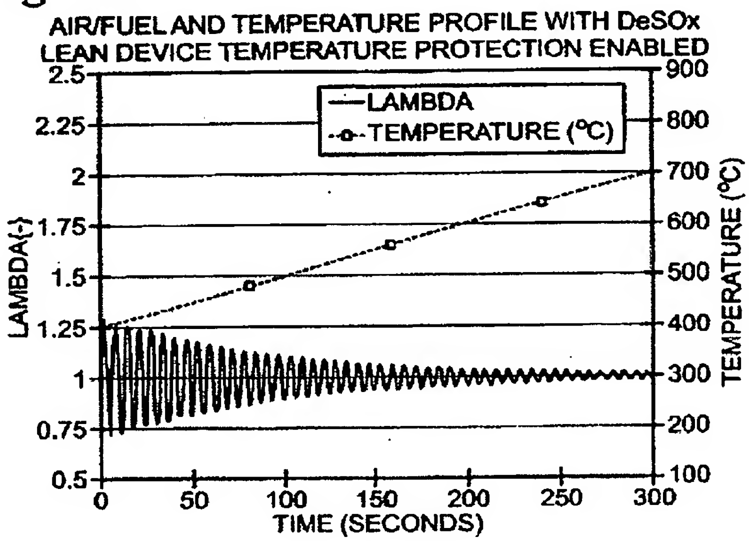
Claims 1-4, 6, 8, 9, 12-15, 17, and 20 are rejected under 35 USC § 102(e) as being anticipated by Boegner et al. (U.S. Patent no. 6,637,189). Claims 5 and 16 are rejected under 35 USC § 103(a) as being unpatentable over Boegner et al. as applied to claims 4 and 15, respectively, above, in view of legal precedent. Claims 7, 10 and 18-19 are rejected under 35 USC 103(a) as being unpatentable over Boegner et al. as applied to claims 1 and 15, respectively, above, in view of Hepburn et al. (U.S. Patent No. 6,199,373). Claim 11 is rejected under 35 USC103(a) as being unpatentable over Boegner et al. as applied to claim 1 above, in view of Takahashi et al. (U.S. Patent No. 6,237,330).

Before discussing the cited art in detail, Applicants respectfully submit that it may be helpful to review some background information. The present application relates to the interrelated degradation of an emission control device due to the relatively slow accumulation of sulfate (derived from the combustion of fuel sulfur) and the loss in catalytic activity resulting from loss of platinum surface area (due to coarsening of the supported particles of platinum). Specifically, in prior approaches, when trying to reduce sulfur contamination by oscillating the air-fuel ratio at high temperatures, conditions may be created (high temperature lean conditions, for example) that increase particles coarsening. As such, in attempting to address one source of degradation, another was created.

In one example, the present application addresses this paradox by limiting the air-fuel ratio oscillation amplitude during the sulfur removal, where the air-fuel ratio amplitude is limited based on exhaust temperature. In this way, it is possible to reduce exposing the device to

conditions that increase particle growth, while at the same time still allowing desulfurization. See Applicants' specification, pages 1-3. Further, in one particular example, as the temperature increases, the peak air-fuel ratio amplitude is correspondingly decreased, as shown in Fig. 16, reproduced below:

Fig. 16



Claim 1.

Turning now to the cited reference, Boegner et al. is applied to claim 1 under 102(e).

Upon review it appears that Boegner et al. is unaware of the interrelated issues between particle growth and sulfur degradation. As such, Boegner et al. describes an approach in which the air-fuel ratio is oscillated to reduce sulfur, without any concern for adjusting the amplitude of the oscillation based on temperature.

The Office action asserts at page 3that Boegner et al. shows:

> of column 4 to line 15 of column 5), where a peak amplitude of the air-fuel oscillations is determined based on an exhaust temperature (see lines 14-27 of column 6, claim 2, and especially lines 25-29 of column 4 where Boegner et al. disclose that a desulfurization temperature range must be maintained during Phase III).

However, upon review of the citations, Applicants fail to see any adjustment of the peak amplitude based on exhaust temperature. In particular, Col. 6:14-27, reproduced below, simply states that the amplitude can be adapted to be as rapid as possible, and set as a function of the operating state of the system. Applicants find no mention of temperature.

> It will be understood that during the oscillating modulation of the accumulator air ratio 1_v in the third desulphurization phase III, the amplitude (i.e., the difference between the at least stoichiometric accumulator air ratio value 1_v and the substoichiometric value 1_{v2}) and/or the frequency (i.e., the regularity with which there is a Switch between an oxidizing or stoichiometric atmosphere), on the one hand, and a reducing atmosphere, on the other hand,) can be adapted to the conditions required for sulphate decomposition to be as rapid as possible and in this case, in particular, can be set as a function of the operating state of the system, specifically both within a desulphurization process and also between different desulphurization processes which are carried out periodically.

Looking next to claim 2, it also appears to refer generally to operating conditions, but again as no mention of temperature.

Finally, looking to Col. 4:25-29 (and beyond), it mentions that temperature is maintained at an elevated state, but fails to provide any hint that the amplitude of oscillation should be tied to the temperature, or used to maintain temperature. Rather, the specific teachings of Boegner et al. are to use the secondary air feed rate (and corresponding reducing agent quantity) as the primary method of controlling temperature (by generating heat due to the burning of oxidants and reductants in the exhaust as in Phase I). The only alternative noted is to use an electric

heater. See, Col. 4:17-24, Col. 4:25-40 and Col. 4:55-58. Applicants find nothing linking the amplitude of air-fuel ratio oscillations during Phase III to exhaust temperature.

Thus, Applicants fail to find any specific disclosure where an amplitude of air-fuel oscillations at elevated temperature is determined based on exhaust temperature. As such, the rejection of all claims should be withdrawn, as the rejection of every claim is dependent upon Boegner et al.

Claim 2.

Regarding claim 2, it states that:

> wherein said peak allowable amplitude decreases as temperature increases, where said air-fuel ratio oscillations are maintained below said peak value to prevent operation that could increase platinum particle size.

The Office action states that:

> Re claim 2, in the method of Boegner et al., the peak allowable amplitude decreases as temperature increases, where the air-fuel ratio oscillations are maintained below the peak value to prevent operation that could increase platinum particle size (see lines 3-6 and lines 42-65 of column 5).

However, Applicants have reviewed the citations of Col. 5 and fail to find any such disclosure. Specifically, Col. 5:3-6 states:

> Overall, the interval lengths and accumulator air ratios _s1, _S2 are adapted to one another in such a way that the accumulator air ratio _s on average remains in the rich range, preferably at a level which is slightly lower than one.

While the average may be rich, or slightly lower than one, this says nothing regarding how the peak amplitude changes with temperature, let alone that the amplitude decreases as temperature increases.

Looking to the second citation, Col. 5:42-65, it states:

> It has been found that providing successive intervals with an oxidizing atmosphere and a reducing atmosphere allows very effective desulphurization to be achieved in the NO_x or SO_x accumulator. In periods with a rich accumulator air ratio, i.e. a reducing atmosphere, deposited sulphates are broken down, preferably under the catalytic action of a precious metal catalyst material used for the accumulator body. During this sulphate decomposition, sulfides are formed, which begin to cover the precious metal material so that there is a risk of a reduction in the catalytic activity thereof. Before the precious metal material is noticeably poisoned in this way by the sulfides formed, so that its catalytic action begins to drop, the process is switched to an interval with an oxidizing or stoichiometric atmosphere (i.e., with a superstoichiometric or stoichiometric accumulator air ratio). This utilizes the discovery that the sulfides which have previously been formed can easily be oxidized to form SO_2 by the oxygen which is now present, possibly in excess, and can be discharged from the accumulator in this form. As a result, the sulfides formed can be cleaned off the precious metal material, with SO_2 being released, before the sulphate decomposition rate decreases considerably. Then, the process is set back to an interval with a reducing atmosphere, in order to continue the decomposition of sulphates.

Again, Applicants can find no mention of temperature anywhere in this entire citation, and certainly can find no mention of particle size, air-fuel ratio amplitude of oscillation decreasing with increased temperature, or any other relevant features.

Possibly the Office action has provided incorrect citations, since the above citations appear irrelevant to claim 2. If a subsequent Office action corrects this error, Applicants respectfully request that the action be made non-final so that Applicants have an adequate opportunity to respond.

However, as Applicants can find nothing in Boegner et al. that shows the features of claim 2, Applicants respectfully request that the rejection of claim 2 be withdrawn.

<u>Claims 4, 6, 15, 17.</u>

Claims 4 and 6 respectively state that the oscillations (which occur when temperature reaches a preselected value) are asymmetric (claim 4), or symmetric (claim 6). The Office action

states that Boegner et al. shows both features, and specifically cites Phase III as showing symmetric operation, while cited Col. 4:65-Col.5:3 as showing asymmetric operation. However, both citations refer to the same operation of Phase III shown in Fig. 1C. Applicants are confused how the same disclosure can be both symmetric and asymmetric. Applicants thus request clarification.

__Claims 5 and 16__

With regard to claims 5, it states that a time integral of the lean oscillation is equal to a time integral of the rich oscillation. The Office action admits no reference shows such a feature, and states:

> Boegner et al. disclose the claimed invention except for specifying that a time integral of the lean oscillation is equal to a time integral of the rich oscillation. It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide a specific optimum value of hole diameter, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d

As claim 5 does not provide an specific optimum value of hole diameter, Applicants submit that the rejection is in applicable. Applicants again presume that this rejection is in error. Again, if a subsequent Office action corrects this error, Applicants respectfully request that the action be made non-final so that Applicants have an adequate opportunity to respond.

Further, Applicants respectfully submit that claim 5 does not simply claim an "optimum value" but rather claims a specific feature that Applicants have discovered provides a unique advantage. Specifically, it allows the oscillation to be asymmetric (so that the high temperature lean conditions may be reduced) yet still provide substantially chemically counteracting amounts of oxidants and reductants to thereby reduce emissions. Applicants can find no such disclosure in the cited art.

Claims 7 and 18

Claim 7 states that the amplitude of said air-fuel oscillations is also based on an oxygen storage amount of an upstream emission control device located upstream of the emission control device. In this way, Applicants can further reduce operation at high temperature lean conditions that may results in increased particle size. In other words, the air-fuel oscillations from the engine are not necessarily the same oscillations in a downstream emission control device – and this is due to the oxygen storage of an upstream device. This is a separate issue from that addressed by Hepburn, which as noted by the Examiner is aimed at providing a lean and rich breakthrough for generating heat. Further, Hepburn teaches away from the approach of claim 1 and Boegner et al., in that it teaches providing a rich bias upon reaching the desulfation temperature, not oscillating the air-fuel ratio.

As such, Applicants submit that the combination of references is improper.

Based on the foregoing comments, the above-identified application is believed to be in condition for allowance, and such allowance is courteously solicited. If any further amendment is necessary to advance prosecution and place this case in allowable condition, the Examiner is courteously requested to contact the undersigned by fax or telephone at the number listed below.

Please charge any cost incurred in the filing of this Amendment, along with any other costs, to Deposit Account No. 06-1510. If there are insufficient funds in this account, please charge the fees to Deposit Account No. 06-1505.

CERTIFICATE OF FACSIMILE

I hereby certify that this correspondence is being deposited via facsimile to the U.S. Patent and Trademark Office addressed to: Mail Stop AMENDMENT, Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450 at (571) 273-8300 on March 13, 2007.

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Respectfully submitted,

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